

## Multilayered Oscillating Device With Spine Support

[0001] This application claims the benefit of U.S. Provisional Application No. 60/424,915 filed on November 8, 2002, entitled "Composite MEMS Micromirror Structure for High Frequency Operation Without Dynamic Deformation," which application is hereby incorporated herein by reference.

### CROSS-REFERENCE TO RELATED APPLICATIONS

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[0002] This application relates to the co-pending and commonly assigned patent application Serial No. ~~10/682,015~~ entitled "Multilayered Oscillating Functional Surface," (Attorney Docket TI-35578) filed concurrently herewith, which application is hereby incorporated herein by reference.

### TECHNICAL FIELD

[0003] The present invention relates generally to rapidly pivoting multilayered MEMS (micro-electric mechanical systems) torsional hinge devices, and more specifically to high-speed pivoting mirrors, including scanning mirrors operating at a resonance frequency. A hinge layer having a first set of torsional hinges for providing the back and forth pivoting at a controlled frequency about a first axis includes an attaching member with a front side and a back side. A front layer having a functional surface, such as a mirror or reflective surface, is bonded or mounted to the front side of the hinge layer, and a back layer having a mass moment equal to the front layer is bonded or mounted to the back side of the hinge layer. According to one embodiment, the mass moment of the front layer is the mass of the front layer times the distance or offset of the center of the mass of the front layer from the first axis and the mass moment of the back layer is the mass of the back layer times the distance or offset of the center of the mass of the back layer from the first axis. The front layer and the attaching member of the hinge layer